Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration Units (CISWI)

Pollutants Emitted and Health Impacts
(June 9, 2010)

Introduction:

On June 9, EPA published a proposed rule in the Federal Register (75 FR 31938) which would reduce emissions from commercial and industrial solid waste incinerators. An incinerator unit covered under this rule is any device used to burn solid waste at a commercial or industrial facility. This document highlights the pollutants emitted from these sources and the health impacts associated with the pollutants emitted.

What air pollutants from commercial and industrial solid waste incinerators (CISWI units) will be reduced as a result of this rulemaking?

The proposed rule would reduce emissions of several common air pollutants, such as particulate matter, carbon monoxide, nitrogen oxides, and sulfur dioxide. The proposed rule would also reduce emissions of some toxic air pollutants including metals (i.e., mercury, lead, and cadmium), hydrogen chloride, and dioxins/furans. Toxic air pollutants, also known as hazardous air pollutants, are those pollutants known or suspected of causing cancer and other serious health effects. Additional information on the pollutants that will be reduced by the rule are discussed in the Regulatory Impacts Analysis for this proposed rule.

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How does the proposed rule limit these pollutants?

The proposed rule would establish emission limits for nine pollutants emitted from CISWI units:

- mercury
- lead
- cadmium
- hydrogen chloride
- dioxins/furans
- particulate matter
- carbon monoxide
- nitrogen oxides
- sulfur dioxide

The proposed limits would keep an estimated 30,000 tons of these pollutants from being emitted into the air. Specifically, EPA expects to reduce 3,218 tons of hydrogen chloride and sulfur dioxide; 1,760 tons of particulate matter; 23,570 tons of carbon monoxide; 1,260 tons of nitrogen oxides; and 12 tons of metals (i.e., lead, cadmium, and mercury) and dioxins/furans.

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What are the health effects of the pollutants emitted by CISWI units?

Exposure to the air pollutants emitted by these sources is associated with a variety of adverse health effects. These adverse health effects include cancer and non-cancer health impacts that can affect every major system in the body, including respiratory, cardiovascular, renal, immune, reproductive, and central nervous systems. EPA considers three of the air toxics emitted by these sources to be known or probable human carcinogens (cause cancer). These are cadmium, lead, and dioxins/furans. We do not know the extent to which the adverse health effects described above occur in the populations surrounding these facilities. However, this proposed rule would reduce emissions and subsequent exposures.

We discuss the health effects associated with the pollutants for which there are proposed limits in more detail below.

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Toxic Air Pollutants:

Mercury

Mercury is a naturally occurring element that is present throughout the environment, and human activity, such as burning coal, can release some of that mercury into the air, water, and soil. Mercury is a neurotoxic substance that can produce a wide range of health effects depending on the amount and timing of exposure. At high doses, mercury exposure can cause tremors, inability to walk, convulsions, and even death. At levels more commonly seen in the United States, the mercury exposure effects documented include more subtle yet serious damage to the senses and brain. Repeated exposures to low levels of mercury vapor over long periods have been associated with irritability, impulsiveness, drowsiness, impaired memory, and sleep disturbances. These effects may occur at lower levels of exposure in children than adults.

Lead

Lead is a naturally-occurring element in the environment. Lead is considered a probable human carcinogen. Once taken into the body, lead distributes throughout the body in the blood and is accumulated in the bones. Depending on the level of exposure, lead can adversely affect the nervous system, kidney function, immune system, reproductive and developmental systems and the cardiovascular system. Lead exposure also affects the oxygen carrying capacity of the blood. The lead effects most commonly encountered are neurological effects in children and cardiovascular effects (e.g., high blood pressure and heart disease) in adults. Infants and young children are especially sensitive to even low levels of lead, which may contribute to behavioral problems, learning deficits and lowered IQ.

Cadmium

Cadmium is considered a probable human carcinogen. Higher level, short-term effects of cadmium inhalation are mainly on the lungs, such as pulmonary irritation. Long-term inhalation can lead to a build

up of cadmium in the kidneys, causing kidney disease and can also damage the lungs resulting in emphysema and lung cancer.

Hydrogen chloride

Hydrogen chloride, also called hydrochloric acid, is corrosive to eyes, skin and mucous membranes. Inhalation of higher concentrations can irritate and inflame eyes, nose and respiratory tract, as well as cause pulmonary edema. Prolonged low-level exposure can cause dental discoloration and erosion. Animal studies have shown reproductive impacts. EPA has not classified hydrogen chloride for carcinogenicity.

Dioxin/Furans

Dioxin is the abbreviated or short name for a family of toxic substances that all share a similar chemical structure. Dioxins have been classified by EPA as a likely human carcinogen. Because dioxins are widely distributed throughout the environment in low concentrations, most people have very low but detectable levels of dioxins in their tissues. These very low levels have accumulated over a lifetime and will persist for years, even if no additional exposure were to occur. Short-term exposure to high levels of dioxins may result in skin lesions, such as chloracne and patchy darkening of the skin, and altered liver function. Long-term exposure is linked to impairment of the immune system, the developing nervous system, the endocrine system and reproductive functions. Developing fetuses are most sensitive to dioxin exposure. Newborns may also be more vulnerable to certain health effects.

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Common Air Pollutants:

Particulate Matter (PM)

Particulate matter, also known as particle pollution, is a complex mixture of extremely small particles and liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Exposure to such particles can affect the lungs and the heart. Numerous scientific studies have linked particle pollution exposure to a variety of problems including, irritation of the airways, coughing, difficulty breathing, decreased lung function, asthma, chronic bronchitis, irregular heartbeat, and heart attacks.

Carbon Monoxide (CO)

Carbon monoxide in the surrounding air is primarily formed by the incomplete combustion of fossil-fuels and other organic (carbon-based) fuels like wood or vegetable-based oils. Carbon monoxide can also be formed by photochemical reactions in the atmosphere. Inhaled carbon monoxide goes into the bloodstream where it binds oxygen so the body cannot use it. This can cause a broad range of adverse effects throughout the body, depending on the carbon monoxide concentration and duration of exposure. Short-term exposure is linked to nervous system, cardiovascular and respiratory impacts and can result in sickness and death. Chronic long–term exposure may also cause nervous system effects, as well as developmental effects or adverse birth outcomes Especially vulnerable are the very old or developing young, diabetics, and those with preexisting pulmonary or cardiovascular disease.

Nitrogen Oxides

Nitrogen oxides are a mixture of gases that are composed of nitrogen and oxygen. Current scientific evidence links short-term nitrogen oxides exposures with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma. Low levels of nitrogen oxides in the air can irritate your eyes, nose, throat, and lungs, possibly causing you to cough and experience shortness of breath, tiredness, and nausea. Exposure to low levels can also result in fluid build-up in the lungs. Longer-term exposure can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease.

Sulfur Dioxide

Short-term inhalation of sulfur dioxide can cause adverse respiratory impacts like narrowing of the airways leading to increased asthma symptoms. Sulfur dioxide can react with other compounds in the air to form small particles. These small particles penetrate deeply into the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease.

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